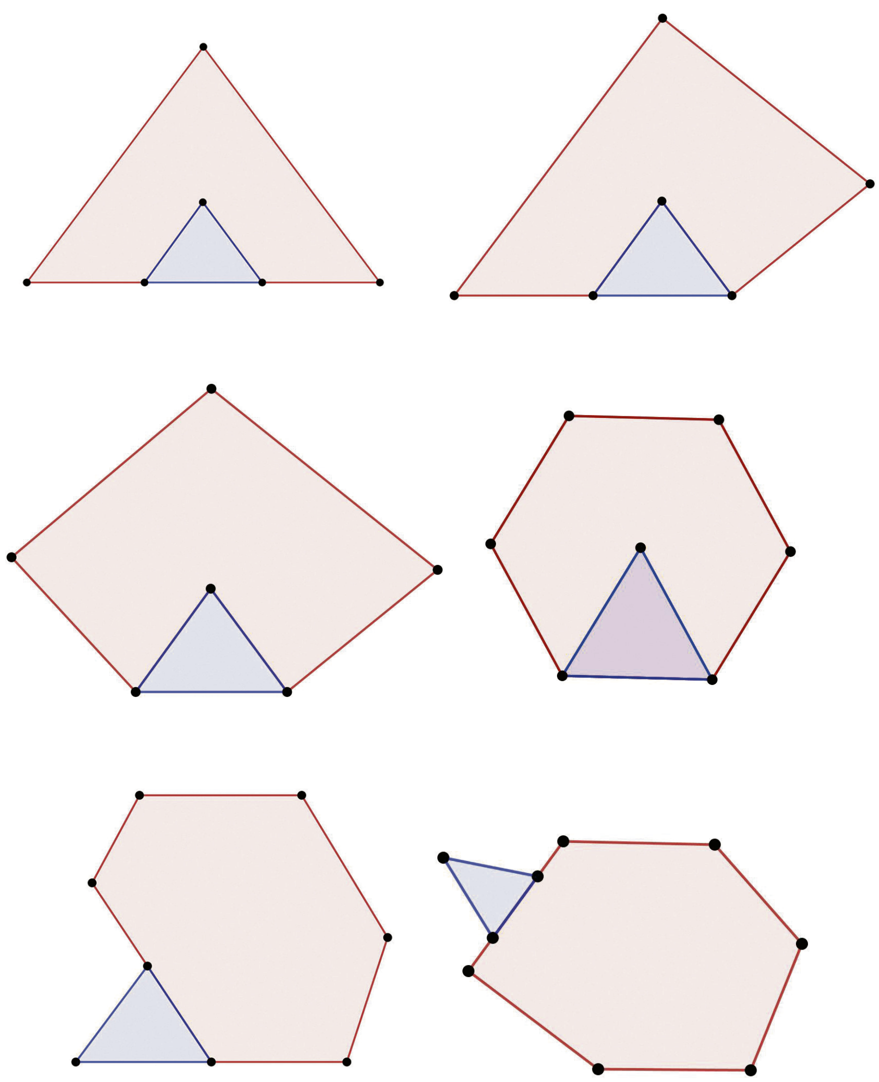
PUZZLE 1

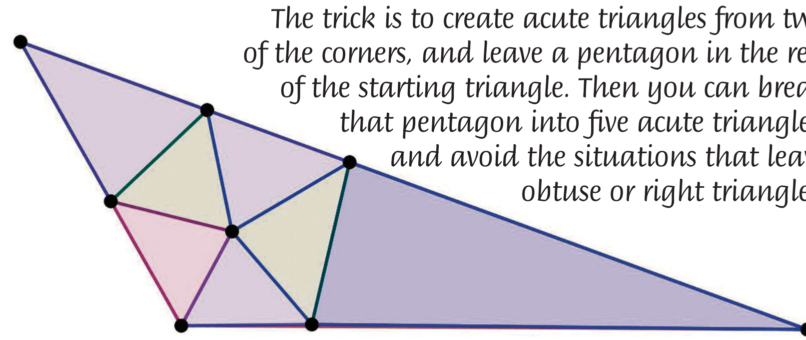
I love this puzzle because I got it wrong the first time I attacked it. I posed it to a classroom of kids, and thought I had all the possibilities accounted for. A student surprised me at the end of class by showing that its possible to take a hexagon and a triangle and conjoin them to make a triangle. I had missed this completely. Here are the answers:



PUZZLE 2

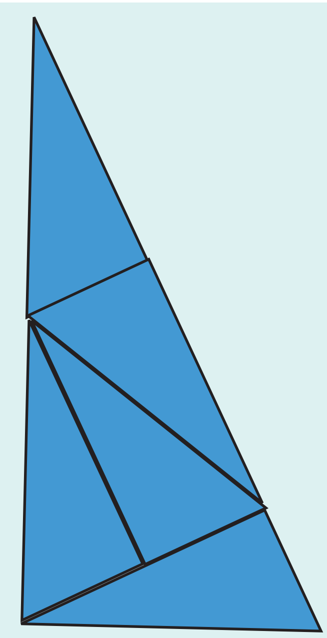
Believe it or not, it takes no fewer than 7 acute triangles for our dissection to contain no obtuse or right triangles.

The trick is to create acute triangles from two of the corners, and leave a pentagon in the rest of the starting triangle. Then you can break that pentagon into five acute triangles, and avoid the situations that leave obtuse or right triangles.

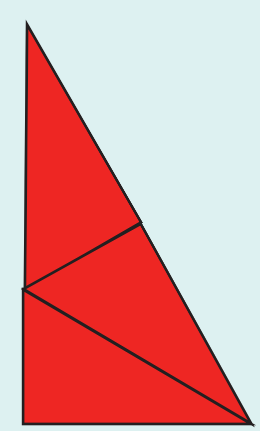


PUZZLE 3

a) Here's 5 triangles arranged to make a scale model of one of the smaller ones. The key here is that to create a similar triangle with 5 times the area, the sides of the triangle have to be scaled up by a factor of √5. Since the sides of the original triangle are 1, 2, and √5, you can check that the final triangle is indeed similar.



b) To find a triangle that can create a scale version of itself with just three copies, we need look no farther than the 30-60-90 triangle, with side lengths, 1, √3, and 2. You can check that the larger triangle is a scale copy of the smaller ones (it is scaled up by a factor of √3).



If you're interested in exploring Puzzle 3 farther, see if you can continue for 6, 7, 8, etc. triangles. Is it always possible? Is there some method to make the construction easier? Happy puzzling!